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HAMILTON

WATER TREATMENT PLANT

DRINKING WATER SURVEILLANCE PROGRAM

ANNUAL REPORT - 1986

MAY, 1987

Ontario
Ministry of the Environment

J. Bishop, Director
Water Resources Branch

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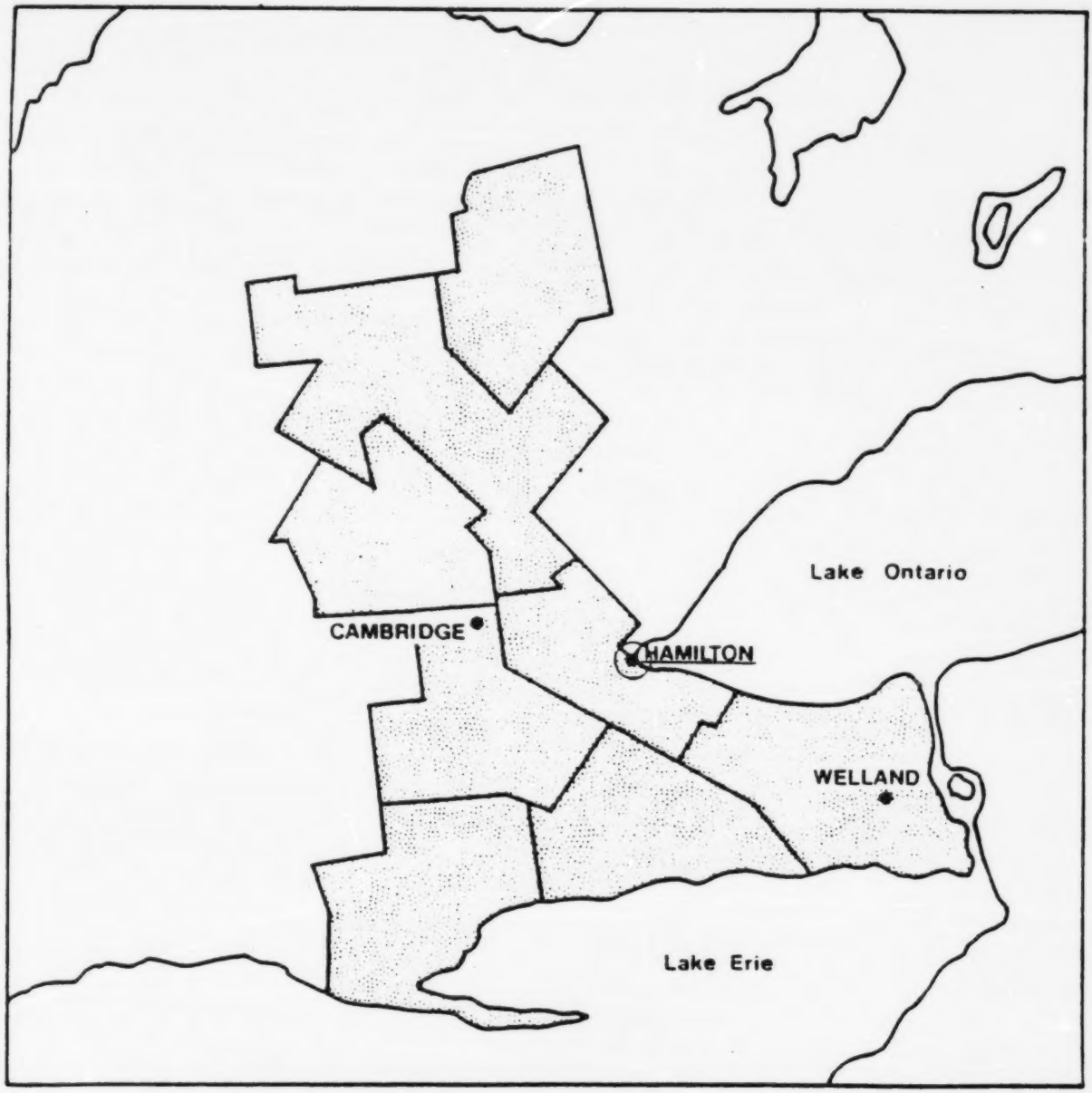
ONTARIO MINISTRY OF THE ENVIRONMENT

West Central Region



HAMILTON WATER TREATMENT PLANT

Location:	900 Woodward Avenue Hamilton, Ontario L8H 7N2 (416-256-4408)
Source:	Lake Ontario
Design Capacity:	909 1000 M3/day
Operation:	Municipal
Plant Superintendent:	J. Halliday
Ministry Region:	West Central Region Hamilton Regional Office 119 King Street West, Box 2112, 12th Floor Hamilton, Ontario L8N 3Z9 (416-521-7640)
Municipalities Served:	Ancaster Town (16,542) Dundas Town (20,081) Hamilton City (307,690) Stoney Creek Town (41,964) Waterdown (25,541)
Treatment Type:	Physical and chemical treatment consisting of coagulation, flocculation, sedimentation and filtration, (conventional) and disinfection as well as fluoridation.
Chemicals Used:	Prechlorination - chlorine Coagulation - alum liquid Dechlorination - sulphur dioxide Post chlorination - chlorination with chlorine and anhydrous ammonium Fluoridation - hydrofluosilicic acid

HAMILTON WATER TREATMENT PLANT

EXECUTIVE SUMMARY
DRINKING WATER SURVEILLANCE PROGRAM, 1986

The Hamilton Water Treatment Plant was sampled 5 times in 1986; results are given for raw and treated samples.

The parameters analyzed fall into several categories: physical parameters and general chemistry, bacterial parameters, metals, and organic substances including volatile and chloroaromatic substances and pesticides.

The discussion of results focuses on health-related parameters found in treated water:

(a) **Organic Substances**

Analysis was carried out for approximately 110 organic compounds. The only volatile compounds found, trihalomethanes (THMs) were always present in treated waters; the highest level recorded for total THMs was 29 ug/L.

None of the pesticides analyzed for was found.

No chlorophenolic or chloroaromatic compounds were found.

(b) **Other Parameters**

The aesthetic ODWO* for organic nitrogen was exceeded in two treated water samples. Of the other physical, general chemistry and microbiological parameters and metals analyzed, for which there are health-related ODWO, none exceeded the objectives, in treated water.

The results of these analyses are consistent with those obtained in other areas of the Great Lakes.

The treated water from the supply did not exceed any known health-related guidelines for organic substances applicable to drinking water.

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* The Ontario Drinking Water Objectives, revised 1983.

HAMILTON WATER TREATMENT PLANT

SUMMARY TABLE OF RESULTS
DRINKING WATER SURVEILLANCE PROGRAM, 1986

The Hamilton Water Treatment Plant was sampled 5 times in 1986.

PARAMETER CATEGORY	TYPE OF SAMPLE RAW	TREATED*
1. GENERAL CHEMISTRY - includes anions such as sulphate, field analyses such as chlorine residual and physical parameters such as colour.		
Total number of parameters in category: **21**		
- Total number of analyses completed	90	90
- Total number of positive results	82	72
- **Number of times guidelines exceeded**	**N/A**	**2**
Guidelines exceeded - aesthetic ODWO** for organic nitrogen (2)		
2. METALS - includes metals such as copper and lead.		
Total number of parameters in category: **24**		
- Total number of analyses completed	108	108
- Total number of positive results	58	54
- **Number of times guidelines exceeded**	**N/A**	**0**
3. BACTERIOLOGY - includes bacteria such as coliforms.		
Total number of parameters in category: **5**		
- Total number of analyses completed	20	20
- Total number of positive results	15	1
- **Number of times guidelines exceeded**	**N/A**	**0**
4. VOLATILES - includes compounds such as benzene and toluene; also included in this category are trihalomethanes (5 parameters), acknowledged to be produced during water treatment.		
Total number of parameters in category: **29**		
- Total number of analyses completed	140	141
- Total number of positive results	4	16
- **Number of times guidelines exceeded**	**N/A**	**0**
5. PESTICIDES -		
Total number of parameters possible in category: **65**		
- Total number of analyses completed	180	180
- Total number of positive results	0	0
- **Number of times guidelines exceeded**	**N/A**	**0**
6. CHLOROAROMATICS AND CHLOROPHENOLS - includes a range of chlorinated organic compounds.		
Total number of parameters possible in category: **19**		
- Total number of analyses completed	71	71
- Total number of positive results	0	0
- **Number of times guidelines exceeded**	**N/A**	**0**

* Total number of analyses completed will not always equal the number of parameters analyzed for multiplied by number of times the supply was sampled, because of accidents during shipping or analyses or analytical difficulties.

** Ontario Drinking Water Objective.

DRINKING WATER SURVEILLANCE PROGRAM

The Drinking Water Surveillance Program (DWSP) for Ontario is a computerized drinking water information system. The objectives of this program are to provide:

- immediate, reliable, current information on drinking water quality,
- a flagging mechanism for 'Objective' exceedence,
- a definition of contaminant levels and trends,
- a comprehensive background for remedial action,
- a framework for assessment of new contaminants,
- an indication of treatment efficiency of plant processes.

Program

The DWSP began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. Water supply locations have been prioritized for surveillance, based primarily on such criteria as population density, probability of contamination and geographical location.

Once the data base becomes established, an assessment of monitoring requirements for the future will be made; monitoring will be continued at the initial locations at an appropriate level and further locations will be phased on to the program as resources permit. It is

estimated that after 4 years of operation, the program will be monitoring 90 locations.

A major goal of the program is to collect valid water quality data, in context with plant operation characteristics in the plant at the time of sampling.

Assessments are carried out at all locations prior to sampling in order to acquire full plant process and distribution system details, and to designate (and retrofit if necessary) all sampling systems and locations.

Samples are taken of the raw (ambient water quality) and treated water at the treatment plants, and also in the distribution systems. In order to determine possible effects of distribution on water quality, both standing and flowing water in old and new sections of the distribution system are sampled. Sampling is carried out by Ministry of the Environment (MOE) Regional staff and/or Municipal personnel who have been trained in the applicable procedures. Comprehensive sampling kits and documented sampling procedures are made available to samplers. This ensures that samples are taken and shipped according to standard protocols and that field testing will supply reliable data. All analyses are carried out using approved documented procedures.

Data Reporting Mechanism

Final analytical results are usually received by the DWSP reporting system within 6 weeks of the time of sampling. At this time, printouts of the completed analyses are sent to the MOE District Officer and the appropriate MOE regional office, and are also retained by the DWSP co-ordinator. The DWSP is able to monitor analysis results and assess trends. Should the level of

a contaminant exceed a health-related Ontario Drinking Water Objective, action is required as outlined in the publication, Ontario Drinking Water Objectives.* The DWSP issues an "Action Alert" which notifies appropriate MOE and health authorities, and supplies a history of the occurrence of the contaminant in the water supply system concerned.

Parameters Analyzed

About one hundred and forty (140) different parameters are routinely measured on DWSP covering microbiological, organic and inorganic substances of concern, as well as process parameters.

Parameters included in the program are based on the following criteria:

- probability that the substance has the potential to cause problems (health-related or aesthetic);
- probability of occurrence in ambient water;
- availability of routine analytical and sampling methods for monitoring and control purposes;
- feasibility of control.

The range of parameters includes those having Ontario Drinking Water Objectives (ODWO), World Health Organization Drinking Water Guideline values, or other

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* Ontario Drinking Water Objectives, revised 1983, published by the Ontario Ministry of the Environment.

jurisdiction's drinking water objectives (e.g. State of California) as well as compounds of concern to other agencies such as the International Joint Commission, and U.S. Environmental Protection Agency.

The parameters monitored routinely during 1986 are shown in Table 1; this table also includes available guidelines which are appropriate for drinking water, and the analytical detection limit (the lowest concentration that can be detected by laboratory analysis) for each parameter.

Analyses for additional pesticides may be included on certain sampling dates; such additional pesticides are selected from the list shown in Table 1A. These analyses may be done on a seasonal basis, in response to an identified concern or because of a potential for occurrence in certain locations. Seasonal analyses for specified additional pesticides are normally carried out at times corresponding to maximal agricultural use or run-off periods, i.e. in spring and fall seasons.

Drinking Water Guidelines

The Ministry of the Environment published a revised edition of "Ontario Drinking Water Objectives" in 1983.

The primary purpose of drinking water objectives is the protection of the health of the public consuming the water. Aesthetic considerations may also provide a basis for drinking water objectives, since the water should be pleasant to drink. The control of such aspects of water quality as hardness, corrosiveness, etc. is also important The limits set are considered to outline the minimum requirements necessary to fulfill the above objectives, and may be either health-related or related to aesthetic and other considerations.

Because this survey covered such a large number of parameters, many of them did not have an ODWO. In order to be able to compare data results to health guidelines, it was necessary to refer to objectives and guidelines developed by other jurisdictions.

The footnotes to Table 1 indicate the sources and derivation of the various guidelines.

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
CHEMISTRY:			Barium	1 mg/L	0.001 mg/L
Conductivity	-	0.01 UMHO/CM	Boron	5 mg/L	0.02 mg/L
			Beryllium	-	0.001 mg/L
Hardness	-	0.5 mg/L	Cyanide	0.2 mg/L	0.001 mg/L
Calcium	-	0.1 mg/L	Cadmium	0.005 mg/L	0.0003 mg/L
Magnesium	-	0.05 mg/L	Cobalt	-	0.001 mg/L
Sodium	-	0.1 mg/L	Chromium	0.05 mg/L	0.001 mg/L
Alkalinity		0.2 mg/L	Copper	1 mg/L	0.001 mg/L
pH	-	-	Mercury	1 µg/L	0.01 µg/L
Fluoride	2.4 mg/L	0.01 mg/L	Molybdenum	-	0.001 mg/L
Chloride	250 mg/L	0.2 mg/L	Nickel	-	0.002 mg/L
Residue total (solids)	-	1 mg/L	Lead	0.05 mg/L	0.003 mg/L
Turbidity	1 FTU	.01 FTU	Selenium	0.01 mg/L	0.001 mg/L
Phosphorus	-	0.002 mg/L	Strontium	-	0.001 mg/L
Phosphates	-	0.0005 mg/L	Vanadium	-	0.001 mg/L
Nitrogen Total Kjeldahl	0.15 mg/L*	0.1 mg/L	Zinc	5 mg/L	0.001 mg/L
Ammonium Total	-	0.05 mg/L			
Colour	5 TCU	0.5 TCU	BACTERIOLOGY (RAW ONLY):		
Nitrates Total	10 mg/L as N	.05 mg/L	Total Coliform MF	-	0
			Total Coliform MF BKGD	-	0
Nitrite	1 mg/L as N	0.0005 mg/L	Fecal Coliform	-	0
			Standard Plate Count MF	-	0
METALS:			(TREATED ONLY):		
Uranium	0.02 mg/L(t)	0.002 mg/L‡	Present/Absent (P/A) Test	Absent	Absent
Iron	0.3 mg/L	0.002 mg/L	Total Coliform MF BKGD	-	0
Manganese	0.05 mg/L	0.001 mg/L	Fecal Coliform	0	0
Aluminum	-	0.003 mg/L	Standard Plate Count MF	<500 orgs/mL	0
Arsenic	0.05 mg/L	0.001 mg/L			

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED (cont'd)

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
VOLATILES:			CHLOROAROMATICS:		
1,1-Dichloroethylene	0.3 µg/L(h)	1.0 µg/l	Hexachloroethane	19000 ng/L(e)	1 ng/L
Dichloromethane	40 µg/L(c)	5 µg/L	1,3,5-Trichlorobenzene	10000 ng/L(y)	5 ng/L
TRS-1,2-Dichloroethylene	-	1 µg/L	1,2,4-Trichlorobenzene	15000 ng/L(y)	5 ng/L
1,1-Dichloroethane	-	1 µg/L	Hexachlorobutadiene	4500 ng/L(e)	1 ng/L
Chloroform	350 µg/L++	1 µg/L	1,2,3-Trichlorobenzene	10000 ng/L(y)	5 ng/L
1,1,1-Trichloroethane	1000 µg/L(c)	1 µg/L	2,4,5-Trichlorotoluene	-	5 ng/L
1,2-Dichloroethane	10 µg/L(h)	1 µg/L	2,3,6-Trichlorotoluene	-	5 ng/L
Carbon Tetrachloride	3 µg/L(h)	1 µg/L	1,2,3,5-Tetrachloro-benzene	-	1 ng/L
Benzene	10 µg/L(h)	1 µg/L	1,2,4,5-Tetrachloro-benzene	38000 ng/L(e)	1 ng/L
1,2-Dichloropropane	-	1 µg/L	2,6,A-Trichlorotoluene	-	5 ng/L
Trichloroethylene	30 µg/L(h)	1 µg/L	1,2,3,4-Tetrachloro-benzene	-	1 ng/L
Dichlorobromomethane	350 µg/L++	1 µg/L	Pentachlorobenzene	74000 ng/L(e)	1 ng/L
Toluene	100 µg/L(c)	1 µg/L	Total PCB's	3000 ng/L(t)	20 ng/L
1,1,2-Trichloroethane	6 µg/L(e)	1 µg/L			
Chlorodibromomethane	350 µg/L++	1 µg/L	PESTICIDES:		
Tetrachloroethylene	10 µg/L(h)	1 µg/L	Hexachlorobenzene	10 ng/L(h)	1 ng/L
Chlorobenzene	100-300 ng/L(h)*	1 ng/L	Heptachlor	3000 ng/L+++	1 ng/L
Trifluorochlorotoluene	-	1 µg/L	Aldrin	700 ng/L**	1 ng/L
Ethylbenzene	1400 µg/L(e)	1 µg/L	PP-DDE	d	1 ng/L
Ethylene Dibromide	0.02 µg/L(x)	1 µg/L	Mirex	-	5 ng/L
P-Xylene	620 µg/L(c)	1 µg/L	Alpha BHC	700 ng/L(c)	1 ng/L
M-Xylene	620 µg/L(c)	1 µg/L	Beta BHC	300 ng/L(c)	1 ng/L
O-Xylene	620 µg/L(c)	1 µg/L	Gamma BHC (Lindane)	4000 ng/L	1 ng/L
Total Trihalomethanes	350 µg/L++	3 µg/L	Alpha Chlordane	7000 ng/L***	2 ng/L
Bromoform	350 µg/L++	1 µg/L	Gamma Chlordane	7000 ng/L***	2 ng/L
1,1,2,2-Tetrachloroethane	1.7 µg/L(e)	1 µg/L	Oxychlordane	-	2 ng/L
1,4-Dichlorobenzene	400 µg/L(e)	1 µg/L			
1,3-Dichlorobenzene	400 µg/L(e)	1 µg/L			
1,2-Dichlorobenzene	400 µg/L(e)	1 µg/L			

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED (cont'd)

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
Pesticides (cont'd)					
OP-DDT	30000 ng/L(d)	5 ng/L			
PP-DDD	d	5 ng/L			
PP-DDT	d	5 ng/L			
Methoxychlor	100000 ng/L	5 ng/L			
Heptachlor Epoxide	3000 ng/L+++	1 ng/L			
Endosulfan 1	74000 ng/L(ea)	2 ng/L			
Dieldrin	700 ng/L**	2 ng/L			
Endrin	200 ng/L	4 ng/L			
Endosulfan 2	74000 ng/L(ea)	4 ng/L			
Endosulfan Sulphate	-	4 ng/L			
Octachlorostyrene	-	1 ng/L			
Toxaphene	5000 ng/L	PA(xx)			

Footnotes:

(l) = Ontario Drinking Water Objectives (ODWO) for drinking water, unless noted.

(t) = ODWO Interim maximum acceptable concentration (IMAC) for drinking water.

(c) = California State Department of Health Action Level for drinking water.

(d) = ODWO for DDT (contains other isomers such as OPDDT and PPDDT).

(e) = US EPA ambient guideline; guideline levels when it is assumed that untreated water and fish and shellfish are consumed from the same body of water.

(ea) = United States Environmental Protection Agency (US EPA) ambient level for endosulfan (contains other isomers).

(h) = World Health Organization (WHO) guideline for drinking water.

(h)* = World Health Organization (WHO) Odour Threshold for drinking water.

(x) = State of Florida, maximum contaminant level for drinking water.

(xx) = the presence of toxaphene is detected in scan used; positive samples would be quantified by special additional analysis.

(y) = New York State (Taste and Odour) proposed drinking water guideline.

++ = total Trihalomethanes.

+++ = combined total; Heptachlor and Heptachlor Epoxide.

* = total Kjeldahl Nitrogen minus Ammonia Nitrogen.

** = total of Aldrin and Dieldrin.

*** = Chlordane is a mixture of alpha and gamma isomers.

‡ = Analysis changed to mass spectrometry method in mid-1986, detection limit 0.0001 mg/L.

TABLE 1A: DRINKING WATER SURVEILLANCE PROGRAM SPECIAL PESTICIDES

Dicamba	Reldan
2,4-D	Ronnel
2,4-DB	Carbofuran
2,4-DP	Propoxur
2,4,5-T	IPC
Silvex (2,4,5-TP)	Aminocarb
Picloram	CIPC
2,4,6-Trichlorophenol	Eptam
2,4,5-Trichlorophenol	Benonyl
2,3,4-Trichlorophenol	Bux
2,3,5,6-Tetrachlorophenol	Diallate
2,3,4,5-Tetrachlorophenol	Sevin
Pentachlorophenol	Sutan
Diazinon	Propazine
Dichlorvos	Atrazine
Dursban	Simazine
Ethion	Sencor (metribuzin)
Guthion	Bladex (Cyanazine)
Malathion	Prometone
Mevinphos	Ametryne
Methyl Parathion	Prometryne
Methyl Trithion	Atratone
Parathion	Alachlor
Phorate (Thimet)	Metolachlor

RESULTS AND DISCUSSION

The parameters analyzed fall into several categories: physical parameters and general chemistry (chemistry), bacterial parameters, metals, and organic substances including volatile and chloroaromatic substances and pesticides. Many of the substances analyzed for are naturally-occurring or treatment by-products.

The results of analysis of raw and treated water samples are shown in Tables 2 and 3. Table 2 shows the categories of parameters analyzed, as well as the total number of analyses which were completed in each category for both raw and treated water samples and the total number of positive results which were obtained. Table 3 lists the sampling dates and the numerical values for each parameter for which analysis produced a positive (quantifiable) result.

The Hamilton Water Treatment Plant was sampled five times in 1986.

(a) Non Organic Substances

There are 154 positive results of 180 reported analyses for physical parameters, such as pH and temperature and general chemistry tests. The results of these tests are used as an indication of the analytical validity and integrity of the samples, the general characteristics of the water, and as a guide to making an assessment of the treatment process; they may also indicate whether any changes occur during the time elapsing between sampling and actual analysis. Organic nitrogen exceeded the aesthetic ODWO in two treated water samples; levels of organic nitrogen above the limit can result in taste and odour problems.

Positive results were obtained for 16 analyses for bacterial parameters out of a total number reported of 40. These bacterial tests include those for species of paramount importance from a public health point of view, and those which assess the general bacteriological quality and characteristics of the water; by this means, a measure is obtained of the overall efficiency of water treatment processes. The only positive result obtained for a treated water sample was one for standard plate count (a measure of the total number of bacteria in a water sample) of 4 organisms per mL; the ODWO recommend that treated water not exceed 500 organisms per mL for standard plate count.

Analyses of 216 tests for metals in the water samples were reported; of these 112 were positive results. Metals can occur naturally and most are generally regarded as being ubiquitous. However, some may be present in water as a result of industrial or other discharges. A small number of metals have public health significance.

Of those parameters discussed above for which there are ODWO, none exceeded the Objectives except for organic nitrogen. Nor did the levels exceed any guidelines for drinking water set by other jurisdictions, such as the U.S. Environmental Protection Agency (US EPA), the World Health Organization (WHO) and Health & Welfare, Canada (H&W, Canada). Furthermore, the results of these analyses are consistent with those obtained in other areas of the Great Lakes.

(b) **Organic Substances**

Of a total of 281 analyses for volatile organic compounds, only 20 were positive; these were from

treated water samples and were all due to the presence of trihalomethanes.

Trihalomethanes (THMs) are acknowledged to be produced during the water treatment process and will almost always only occur in treated waters. Trihalomethanes are comprised mainly of chloroform, chlorodibromomethane and dichlorobromomethane with bromoform occurring occasionally. Results are reported for the individual compounds as well as for their sum, which is expressed as total trihalomethanes (total THM). The ODWO for total THM is 350 ug/L; this level was not exceeded in any of the water samples included in this report, the highest level recorded being 29 ug/L on March 4, 1986.

Two hundred and thirty (230) tests were carried out for twenty three different pesticides; none was found above trace levels. Special pesticides, including those of the chlorophenolic group, were analyzed for in both raw and treated water on one occasion (October 28, 1986); those analysed for are in Table 1A. On December 15, 1986, ametryne, prometone, propazine, atrazine, prometryne, simazine, Sencor, Bladex and atratone were analyzed for in both raw and treated water. None of these pesticides was found. The special pesticide analysis is carried out only once or twice a year at each supply, on a seasonal basis, to correspond to the use and/or loss of such pesticides on agricultural land.

Of the 130 analyses completed for chloroaromatic compounds, there were no positive results.

CONCLUSIONS

The data reveal that for metals, inorganic ions, and bacterial parameters, raw water values are frequently in the detectable range; levels of metals and inorganics are also found in treated water. The levels of metals, inorganic compounds, and bacteria are consistent with those found in other water supplies in the province.

For the organic compounds, most are below quantifiable detection levels, even though the most sophisticated equipment available was employed in the chemical analysis.

ODWO have not been established for some of the compounds analysed; for these few compounds, use was made of appropriate guidelines set by other agencies, such as the World Health Organization, the US Environmental Protection Agency, Health and Welfare Canada or other agencies. None of these guidelines was exceeded.

The treated water at this supply did not exceed any known, health-related guidelines applicable to drinking water.

TABLE 2

HAMILTON WATER TREATMENT PLANT

	PARAMETER GROUP	TYPE OF SAMPLE RAW	TREATED
1.	GENERAL CHEMISTRY		
	- Total samples	90	90
	- Total positives	82	72
2.	METALS		
	- Total samples	108	108
	- Total positives	58	54
3.	BACTERIOLOGY		
	- Total samples	20	20
	- Total positives	15	1
4.	VOLATILES		
	- Total samples	140	141
	- Total positives	4*	16
5.	PESTICIDES		
	- Total samples	115	115
	- Total positives	0	0
6.	CHLOROAROMATICS		
	- Total samples	65	65
	- Total positives	0	0
7.	CHLOROPHENOLS		
	- Total samples	6	6
	- Total positives	0	0
8.	SPECIAL PESTICIDES		
	- Total samples	65	65
	- Total positives	0	0

* See Table 3

Table 3

HAMILTON WATER TREATMENT PLANT DWSP RESULTS

02/11/87

PARAMETERS	UNITS		SAMPLE DATE 86/02/02	86/03/04	86/10/28	86/11/24	86/12/15						
ALKALINITY	MG/L-CAC	R	97.400	96.200	97.600	103.60	98.900						
		T	92.800	92.000	91.800	96.600	94.700						
ALUMINUM	MG/L-AL	R	.093	.036	.047	.029	2.000						
		T	.130	.092	.190	.110	.076						
ARSENIC	MG/L-AS	R	.001				.001						
		T	.001			.001							
BARIUM	MG/L-BA	R	.018	.018	.027	.021	.035						
		T	.019	.018	.026	.021	.020						
BORON	MG/L-BO	R	.020	.030	.030	.040	.030						
		T	.030	.030	.040	.050	.030						
CALCIUM	MG/L-CA	R	39.500	39.000	39.400	40.200	40.000						
		T	40.000	38.800	39.700	39.500	39.600						
CHLORIDE	MG/L-CL	R	26.400	25.000	24.000	25.600	25.000						
		T	28.000	27.200	26.000	27.200	26.000						
COLOUR	HZU	R	5.000	4.000	4.000		4.500						
		T		2.000									
CONDUCTIVITY	UMHO/CM	R	343.00	327.00	315.00	339.00	335.00						
		T	344.00	332.00	320.00	338.00	336.00						
CHROMIUM	MG/L-CR	R	.002	.002			.005						
		T	.003	.002			.001						
COPPER	MG/L-CU	R	.004	.018	.002	.001	.007						
		T	.027	.005	.001	.001	.016						

Table 3 (cont'd)

HAMILTON WATER TREATMENT PLANT OWSP RESULTS 02/17/87

PARAMETERS	UNITS		SAMPLE DATE 86/02/02	86/03/04	86/10/28	86/11/24	86/12/15						
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	R	5 000			1 000							
		T											
IRON	MG/L-FE	R	.008	019	.033	043	4 000						
		T	.120	006	008	009	007						
FLUORIDE	MG/L-F	R	.150	140	.150	140	150						
		T	.920	.920	.950	890	.870						
FIELD COMBINED CHLORINE RESIDUAL	MG/L-CL	R											
		T	860	900	730	750	870						
FIELD TOTAL CHLORINE RESIDUAL	MG/L-CL	R											
		T	.860	980	730	750	.870						
FIELD PH		R	7 650	7 250	7 900	7 700							
		T	7 300	7 300	7 300	7 500							
FIELD TEMPERATURE	DEG C	R	2 000	1 000	11 000	7 000	4 000						
		T	2 000	1 000	11 000	7 000	4 000						
FIELD TURBIDITY	FTU	R	2 700	1 000	1 400	1 600	1 500						
		T	.370	250	220	240	520						
HARDNESS	MG/L-CAC	R	134 40	133 00	133 00	135 00	133 00						
		T	135 30	132 00	133 00	133 00	[illegible]						
STANDARD PLATE COUNT MEMBRANE FILT	CT/ML	R	73 000	10 000		1400 0							
		T				4 000							
MERCURY	UG/L HG	R		020			030						
		T		010									
MAGN SUM	MG/L-MG	R	8 700	8 600	8 350	8 450	8 000						
		T	8 600	8 600	8 200	8 400	8 100						

Table 3 (cont'd)

HAMILTON WATER TREATMENT PLANT DWSP RESULTS

02/17/87

PARAMETERS	UNITS		SAMPLE DATE 86/02/02	86/03/04	86/10/28	86/11/24	86/12/15						
MANGANESE	MG/L-MN	R	.002	.003	.002	.005	.140						
		T	.010	.001	.001	.001							
MOLYBDENUM	MG/L-MB	R	.001		.002								
		T	.001		.001	.001	.001						
SODIUM	MG/L-NA	R	14.000	13.500	12.500	12.500	12.700						
		T	13.500	13.500	12.200	12.500	12.600						
NICKEL	MG/L-NI	R	.001	.001	.002		.004						
		T	.002	.002									
AMMONIUM TOTAL	MG/L-N	R	.152	.022	.036	.020							
		T	.076	.082	.114	.036	.068						
NITRITE	MG/L-N	R		.003	.010	.019							
		T	.005										
TOTAL NITRATES	MG/L-N	R	.450	.410	.295	.430	.650						
		T	.455	.410	.285	.460	.455						
NITROGEN TOTAL KJELDAHL	MG/L-N	R	.270	.250		.120							
		T	.260	.280			.150						
LEAD	MG/L-PB	R					.010						
		T					.004						
PH		R	9.140	8.180	8.360	8.390	8.210						
		T	7.650	7.880	8.200	8.370	8.180						
PHOSPHORUS FIL REACT	MG/L-P	R	.014	.005	.003	.004	.011						
		T	.008	.008	.002								

Table 3 (cont'd)

HAMILTON WATER TREATMENT PLANT DWSP RESULTS

02/17/87

PARAMETERS	UNITS		SAMPLE DATE 86/02/02	86/03/04	86/10/28	86/11/24	86/12/15						
PHOSPHORUS TOTAL	MG/L-P	R	.014	.011		.015	.330						
		T	.011	.012									
TOTAL SOLIDS	MG/L	R	223.00 CRO	213.00 CRO	207.00	206.00	405.00						
		T	224.00 CRO	216.00 CRO	202.00	220.00 CRO	218.00 CRO						
STRONTIUM	MG/L-SR	R	.160	.170	.190	.170	.170						
		T	.160	.170	.180	.170	.160						
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	R	92.000	1.000	13.000 A3C	33.000 A3C	66.000						
		T											
TOTAL COLIFORM BACKGROUND MF	CT/100ML	R	242.00	4.000	610.00	380.00	404.00						
		T											
TURBIDITY	FTU	R	3.300		1.020	1.920	59.000						
		T				.240	.310						
URANIUM	UG/L-U	R			.300	.410	.450						
		T			.330	.400	.380						
VANADIUM	MG/L-V	R					.003						
		T											
CHLOROFORM	UG/L	R	9.000 *										
		T		9.000	13.000	8.000	7.000						
DICHLOROBROMOMETHANE	UG/L	R	8.000 *										
		T		8.000	8.000	8.000	7.000						
CHLORODIBROMOMETHANE	UG/L	R	11.000 *										
		T		12.000	5.000	2.000	5.000						
TOTAL TRIHALOMETHANES	UG/L	R	28.000 *										
		T		29.000	26.000	18.000	19.000						

* Raw and treated samples transposed.

Table 3 (cont'd)

HAMILTON WATER TREATMENT PLANT DWSP RESULTS

02/17/87

PARAMETERS	UNITS		SAMPLE DATE											
			86/02/02	86/03/04	86/10/28	86/11/24	86/12/15							
ZINC	MG/L-ZN	R	.003	.005	.002		.031							
		T	.005	.006	.001		.005							